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IS 6805 (1973): Assmann Psychrometer [PGD 21:
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Indian Standard
SPECIFICATION FOR
ASSMANN PSYCHROMETER

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Indian Standard

SPECIFICATION FOR

ASSMANN PSYCHROMETER

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Indian Standard

SPECIFICATION FOR ASSMANN PSYCHROMETER

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 31 January 1973, after the draft finalized by the Meteorological Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 Psychrometers are either of the stationary screen type or of the portable ventilated type. The latter are more accurate since the depression of the wet bulb reading below the dry bulb reading depends on the speed of the air past the bulbs when the wind speed is low. The Assmann psychrometer is a ventilated instrument, the required air flow past the bulbs being provided by a fan driven by clockwork.

0.3 In the formulation of this standard due consideration has been given to the requirements laid down by the World Meteorological Organization, Geneva, in addition to the special requirements obtaining in this country.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard specifies the requirements for Assmann psychrometer for measuring air temperature, dew point temperature and atmospheric humidity.

2. DESCRIPTION

2.1 The Assmann psychrometer consists of two similar sensitive mercury-in-glass thermometers having range of -10°C to $+50^{\circ}\text{C}$ mounted side by side in a highly polished metal frame. The bulb of one of the thermometers is covered with thin muslin which is moistened with distilled

*Rules for rounding off numerical values (*revised*).

water before use. The thermometers are suspended in the frame with their bulbs surrounded by two thin coaxial metal tubes which are chromium-plated and highly polished; they are thermally insulated from the rest of the frame by retaining pieces and protect the bulbs from the effects of exposure to solar radiation. The tubes may be removed from the frame by unscrewing the retaining pieces. Ventilation of the bulbs is provided by a fan driven by a clockwork mechanism encased in the housing at top, air being drawn past the bulbs and up the hollow central column. The clockwork mechanism runs for about 10 minutes on one winding and provides adequate ventilation of the bulbs for about 5 minutes. The frame, complete with thermometers, may be unscrewed from the housing whenever required. The instrument shall be supplied with a hardwood box, a suitable container for distilled water, a metal support for suspending the instrument and a glass injector for moistening the wet bulb.

3. MATERIAL

3.1 The material used for the fabrication of the frame of the instrument shall be brass.

3.2 The components of the clockwork shall be made from suitable materials satisfying the conditions laid down in **3.4**, **3.5** and **5.7**.

3.3 The material for the screws used in clockwork mechanism shall be steel.

3.4 The material used shall be such that they are not affected by exposure to widely ranging climatic conditions, particularly at coastal stations.

3.5 The materials used shall either be corrosion resistant by themselves or treated suitably to prevent corrosion.

4. DIMENSIONS

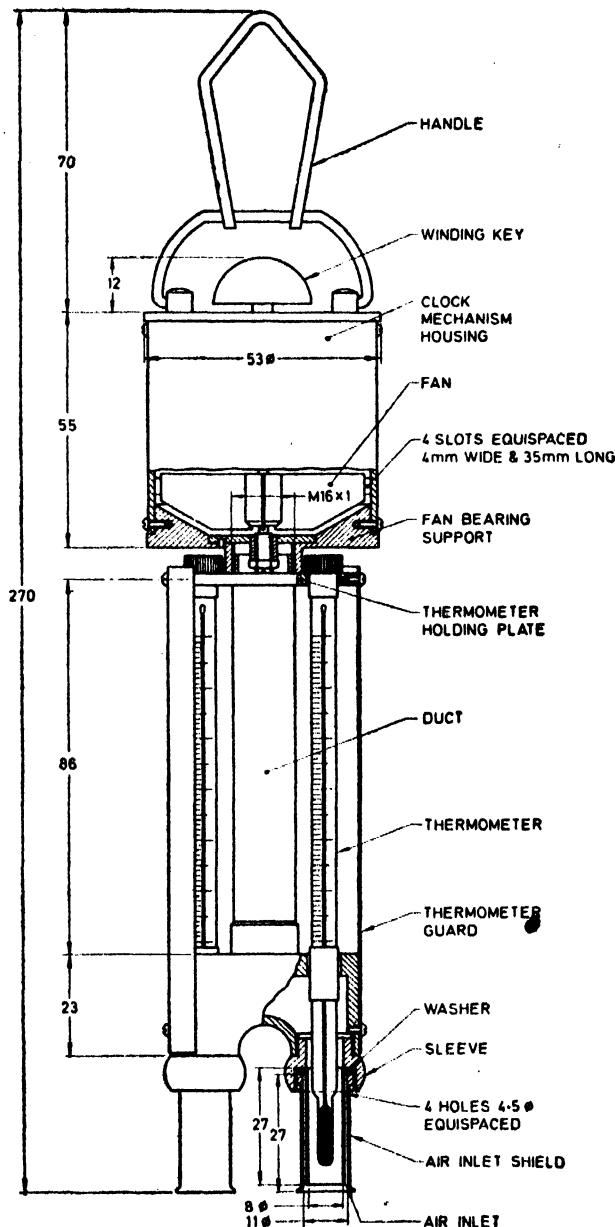
4.1 The main dimensions of the instrument shall be as given in Fig. 1.

5. GENERAL REQUIREMENTS

5.1 In order that any clockwork mechanism may be fitted on any psychrometer frame, the fan bearing support and top end of the duct shall have respectively internal and external threads of size $M16 \times 1$ for sufficient length to ensure stability.

5.2 The lower end of the fan housing shall be such that it may be screwed over the main duct smoothly leaving no gaps.

5.3 The thermometers shall be one of the types as specified in Appendix A.



All dimensions in millimetres.

FIG. 1 ASSMANN PSYCHROMETER

5.4 The clockwork mechanism and fan shall be so designed that in conjunction with the duct and thermometers the speed of the air flowing past the thermometer bulbs shall be of the order of 4 m/s and in any case not less than 2.4 m/s.

5.5 The clockwork mechanism shall run with one full winding for approximately 10 minutes and given adequate aspiration to the thermometers for at least 5 minutes out of the 10.

5.6 A foldable handle shall be provided at the top, as shown in Fig. 1, so that the instrument may be suspended with the thermometers vertical either from a metal support fitting or by hand.

5.7 The clockwork mechanism shall be so designed as to be capable of giving trouble-free service for at least 5 years continuously with normal maintenance.

5.8 The two holes drilled in the lower part of the duct shall be capable of taking in snugly the metal sleeve on the thermometer stem and shall be drilled to $6.8 +0 -0.1$ mm diameter.

5.9 The inner surface of the thermometer guards shall be so curved as to fit well over the thermometer holding plate at the top and the lower portion of the duct below.

5.10 The inside of the duct shall be smooth and free so as to allow unobstructed flow of air through it.

5.11 The tubes of the air inlet shield shall be mounted concentric with the air inlet tubes, so that the gaps between them are maintained in order to avoid the effects of radiation. The air inlet shield shall be separated from the main frame by an insulated sleeve.

5.12 The container for distilled water shall be cylindrical and provided with a water-tight cap. It shall be made from a material that will not contaminate the distilled water.

5.13 The injector shall be a small glass tube with a rubber bulb at one end. The glass tube shall have dimension such that it may be inserted in the gap between the thermometer bulb and the inner radiation shield.

6. WORKMANSHIP AND FINISH

6.1 All exterior metal parts of the instrument shall be chromium plated and polished bright. The workmanship and finish of clockwork mechanism shall be in accordance with IS : 5924-1970*.

*Specification for clock mechanism and drums for meteorological instruments.

7. TESTING AND INSPECTION

7.1 Each Assmann psychrometer shall be tested individually for conformity to all the requirements of this specification.

8. MARKING

8.1 Each psychrometer shall bear the following inscription engraved legibly and neatly on the lower part of the duct:

- a) Name of the instrument: 'ASSMANN PSYCHROMETER';
- b) Serial number and year of manufacture, for example 'No. 123/1972'; and
- c) Manufacturer's name or recognized trade-mark, if any.

8.1.1 The psychrometer may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

9. PACKING

9.1 Each instrument, complete with thermometers, and other accessories shall be packed in a polished hard wood box with hinged lid fitted with suitable padded supports. The accessories shall be placed in separate compartments provided for them inside the box. The instrument, wrapped in tissue paper, shall be packed in the box such that it may withstand normal transit risks. Alternatively, it may be packed as agreed to between the supplier and the purchaser.

APPENDIX A

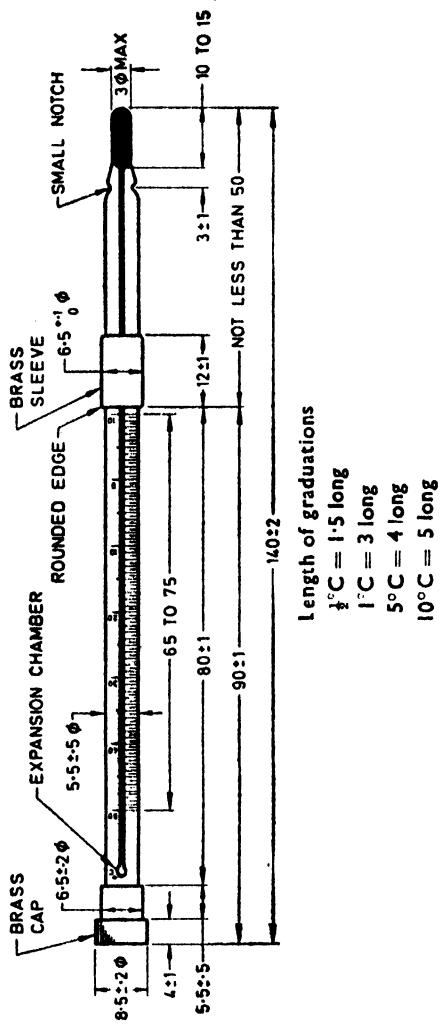
(Clause 5.3)

REQUIREMENTS FOR THERMOMETER FOR ASSMANN PSYCHROMETER

A-1. TYPES

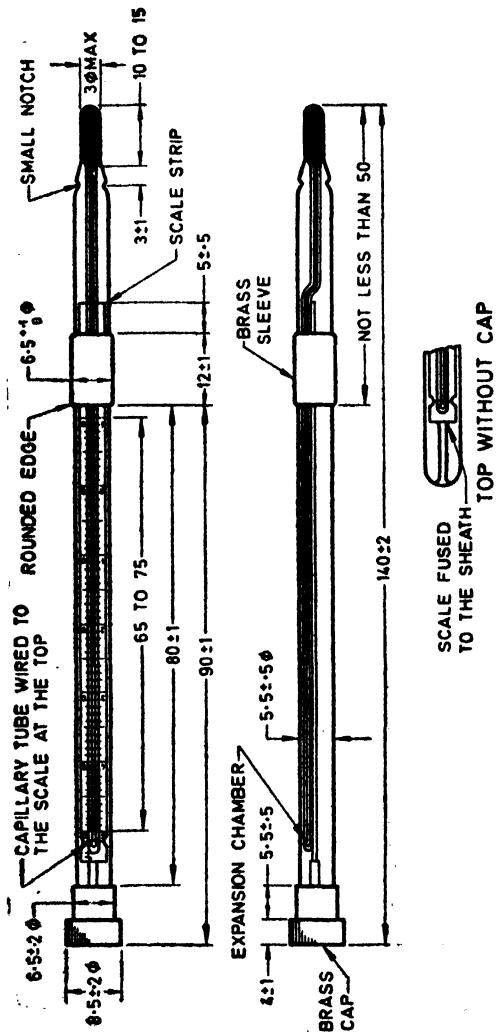
A-1.1 The thermometers for use with Assmann psychrometers shall be one of the following two types, graduated for vertical total immersion:

- a) *Type 1* — Liquid-in-glass, solid stem (see Fig. 2), and
- b) *Type 2* — Liquid-in-glass, enclosed scale (see Fig. 3),



All dimensions in millimetres.

Fig. 2 ASSMANN PSYCHROMETER THERMOMETER, TYPE 1



Length of graduations

1°C = 1.5 long

1°C = 3 long

5°C = 4 long

10°C = 5 long

All dimensions in millimetres.

Fig. 3 ASSMANN PSYCHROMETER THERMOMETER, TYPE 2

A-2. MATERIAL

A-2.1 The glass tubing used in the manufacture of the thermometer shall conform to IS : 4610-1968*.

A-2.2 The recommended thermometric liquid is pure and dry mercury, preferably alloyed with 8·5 percent (by mass) of thallium.

A-2.3 The scale strip shall be made of a suitable opal glass, metal sheet, plastic or tough glazed paper which permits fine clear graduations to be marked on it and does not deteriorate during usage.

A-3. DIMENSIONS

A-3.1 The dimensions of Types 1 and 2 thermometers shall be as specified in Fig. 2 and 3 respectively.

A-4. REQUIREMENTS

A-4.1 The stem shall be straight and the cross section of the capillary tube shall be circular. No enlargement in bore shall be present in the graduated portion of the stem or within 5 mm from either end of the scale.

A-4.2 The bulb shall be cylindrical and in alignment with the stem. The shape and finish of the bulb and the expansion chamber shall be such as not to entrap the thermometric liquid. A small notch about 3 mm above the top of the bulb shall be provided on the stem for tying the muslin securely round the bulb.

A-4.3 The top of the thermometer shall be firmly fixed into a flanged cylindrical chromium plated brass cap. A cylindrical brass sleeve, chromium plated, shall be securely cemented to the stem of the thermometer.

A-4.4 The thermometer shall be so constructed as to withstand a temperature of 65°C without damage. An elongated or pear shaped expansion chamber with a hemispherical top and without re-entrant shoulders shall be provided at the top end of the capillary in a line with the capillary bore to enable the thermometer to withstand the above temperature. The expansion chamber shall not extend within the brass cap at top.

A-4.5 The thermometer shall be suitably annealed before engraving.

A-4.6 The enclosed scale thermometers of Type 2, shall in addition to the requirements specified in **A-4.1** to **A-4.5**, meet the following requirements.

*Specification for glass tubes for general purpose and reference thermometers.

A-4.6.1 The capillary and the sheath shall be fused with the bulb without any constriction.

A-4.6.2 The capillary shall lie flat over the middle line of the scale and shall extend beyond the highest graduation on the scale.

A-4.6.3 The capillary shall be securely wired to the scale at the top and bottom as a means of support.

A-4.6.4 The scale strip shall snugly fit diametrically into the sheath and shall preferably be fused to the sheath at top as shown in Fig. 3 such that its position relative to the capillary remains unaltered at all times.

A-4.6.5 The sheath shall be thoroughly dried before sealing so that during use, no visible condensation takes place inside.

A-5. GRADUATION AND FIGURING

A-5.1 The thermometers shall be graduated for total immersion and shall have a nominal range of -10°C to $+50^{\circ}\text{C}$.

A-5.2 The graduation lines shall be clearly engraved at each 0.5°C and shall be of uniform thickness not exceeding 0.15 mm. They shall be filled with permanent black pigment.

A-5.3 The graduation lines shall be at right angles to the axis of the thermometer when the thermometer is viewed from the front in a vertical position. They shall all start from an imaginary line parallel to the axis on the left hand side in thermometer of Type 1 and shall extend almost equally on both sides of the capillary in thermometer of Type 2. The lengths of graduation lines shall be as shown in Fig. 2 and 3.

A-5.4 The numerals 10, 0, 10, 20, 30, 40 and 50 shall be etched at the right places on the stem as shown in Fig. 2 and 3. They shall be bold, upright and easily legible when the thermometer is held vertically for reading.

A-5.5 The zero figure and the figures indicating positive temperatures shall be filled in black while those indicating negative temperatures shall be in red.

A-5.6 The figures shall be placed in such a way that they are either bisected by an extension of the line to which they refer or are placed immediately above the line to which they refer.

A-6. ACCURACY

A-6.1 Scale Error — The maximum permissible scale error at any point below 0°C shall be within -0.3 to $+0.2^{\circ}\text{C}$ and above 0°C , within -0.2 to $+0.1^{\circ}\text{C}$.

A-6.2 Interval Error — The change of error between the points separated by an interval of 17°C on the stem shall not exceed 0.3°C below 0°C and 0.2°C above 0°C .

A-7. TESTING AND INSPECTION

A-7.1 Each thermometer shall individually comply with all the requirements of this specification. The accuracy tests shall be carried out in accordance with IS : 6274-1971*.

A-8. MARKING

A-8.1 Each thermometer shall be marked legibly with the following:

- a) The letter ' $^{\circ}\text{C}$ ' near the top of the scale;
- b) Maker's name or recognised trade-mark, if any, at the back of the thermometer; and
- c) Serial number and year of manufacture.

A-9. PACKING

A-9.1 Each thermometer shall be wrapped in thin tissue paper and packed in a circular cardboard case approximately 13 mm in outside diameter; alternately, they shall be suitably packed as agreed to between the purchaser and the supplier.

*Method of calibrating liquid-in-glass thermometers.

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- 4849-1968 Rain measures
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- 5900-1970 Hair hygrometer
- 5901-1970 Thermograph, bimetallic
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- 5924-1970 Clock mechanisms and drum for meteorological instruments
- 5945-1970 Barograph, aneroid
- 5946-1970 Whirling psychrometers
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- 5948-1970 Thermometer screens
- 5973-1970 Pan evaporimeter

AMENDMENT NO. 1 MAY 1994
TO
IS 6805 : 1973 SPECIFICATION FOR ASSMANN
PSYCHROMETER

(*Page 3, clause 5.1*) — Insert 'Antimagnetic and' between the words 'are' and 'not'.

(*Page 5, clause 5.5*) — Add the following at the end of the clause:
'Suitable electrically driven mechanism can also be used to provide adequate aspiration to the thermometers.'

(*Page 5, clause 6.1, line 3*) — Substitute 'IS 5924 : 1988 (first revision)' for '5924 : 1970'.

(*Page 6, Appendix A, clause A-1.1*) — Add at the end of the sentence:
'(Similar range of thermometers with longer length can also be used so that the overall dimension of the instrument does not exceed 270 + 30 mm, maximum)'.

(*Page 11, clause A-8.1, line 1*) — Substitute 'Psychrometer' for 'thermometer'.

(*Page 11, clause A-9.1, line 1*) — Substitute 'Psychrometer' for 'thermometer'.

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